



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación



NEMO in 2021

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Ocean WG

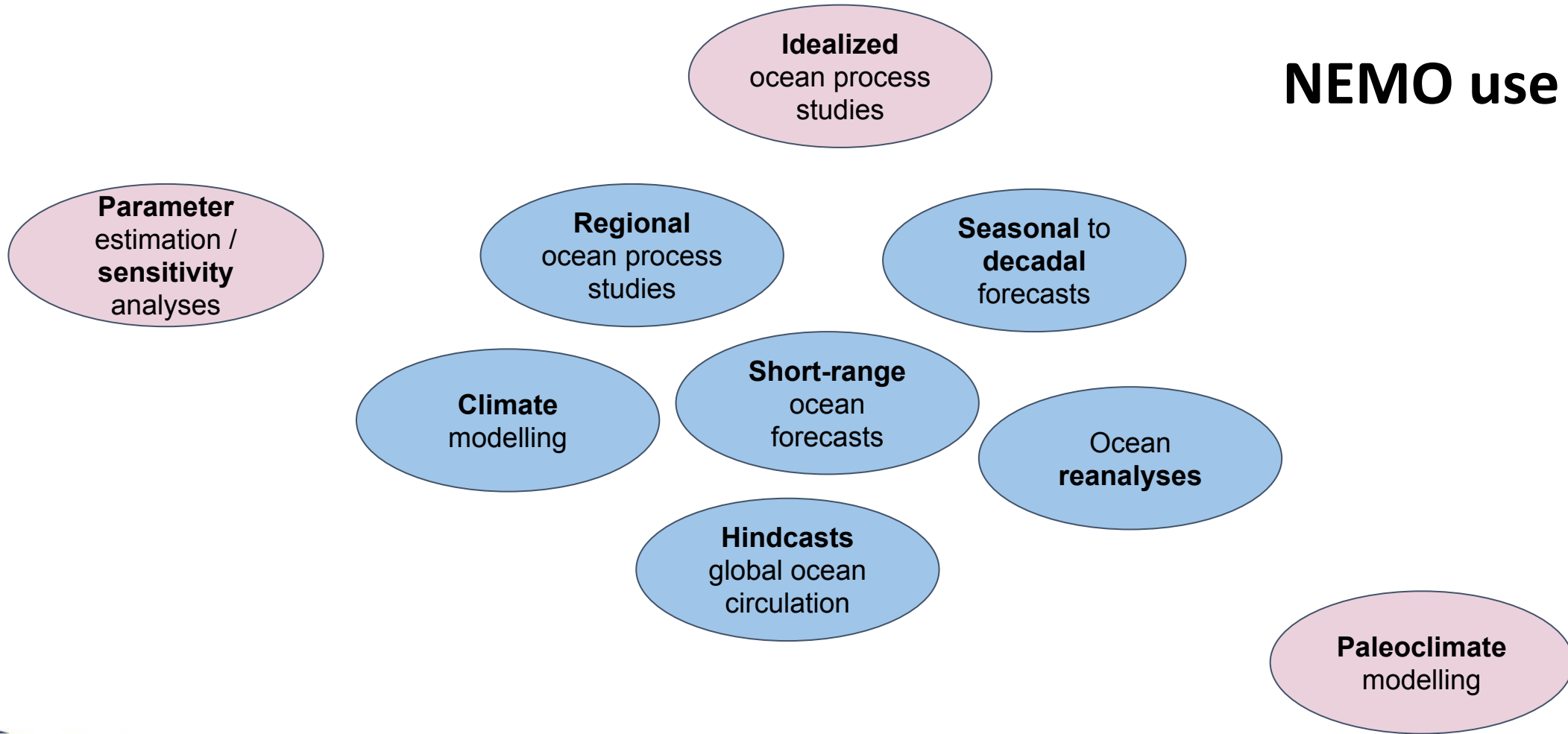
17/11/2021

NEMO Development Strategy v2

- Developers Committee meeting at BSC (2017). NDS 2018 - 2022
- **Long-term strategy**
 - Efficient and scalable code to exploit future **HPC technologies**.
 - Describing accurately the steering of oceanic flows from global to **kilometric scale** through the **interaction** with **coastlines, shelves and bathymetry**
 - Solve ocean dynamics at **kilometric scale** through the development of accurate **numerical schemes** and the explicit representation of key **physical processes**
 - Flexible, generic **interface** between NEMO and detailed, downstream **coastal** modelling systems
 - Prepare the exploitation of the next generation **high resolution observing networks**
 - Priority: **Global 1/36° - 1/48°** with **nested meshes** of 1/100°

NEMO Development Strategy v2

NEMO use cases



NEMO 4.0

- **Enhancements:** new **tracer adv schemes**, new **vorticity schemes**, improvements in iso-neutral mixing, lateral physics...
- **Air-sea:** **Aerobulk** package, tidal self attraction
- **Sea-ice:** new **SI3** model
- **Wave coupling:** coupled interface to **external wave model**
- **TOP-BGC:** modular structure, improvements in **PISCES** model
- **HPC:** reduce number of **MPI communications**, standard **dynamical allocation**
- **Simplification:** revised **namelists**, removal of **cpp keys**, generalised **comm. routines**, new **configuration interface**. Default **land subdomain** removal.

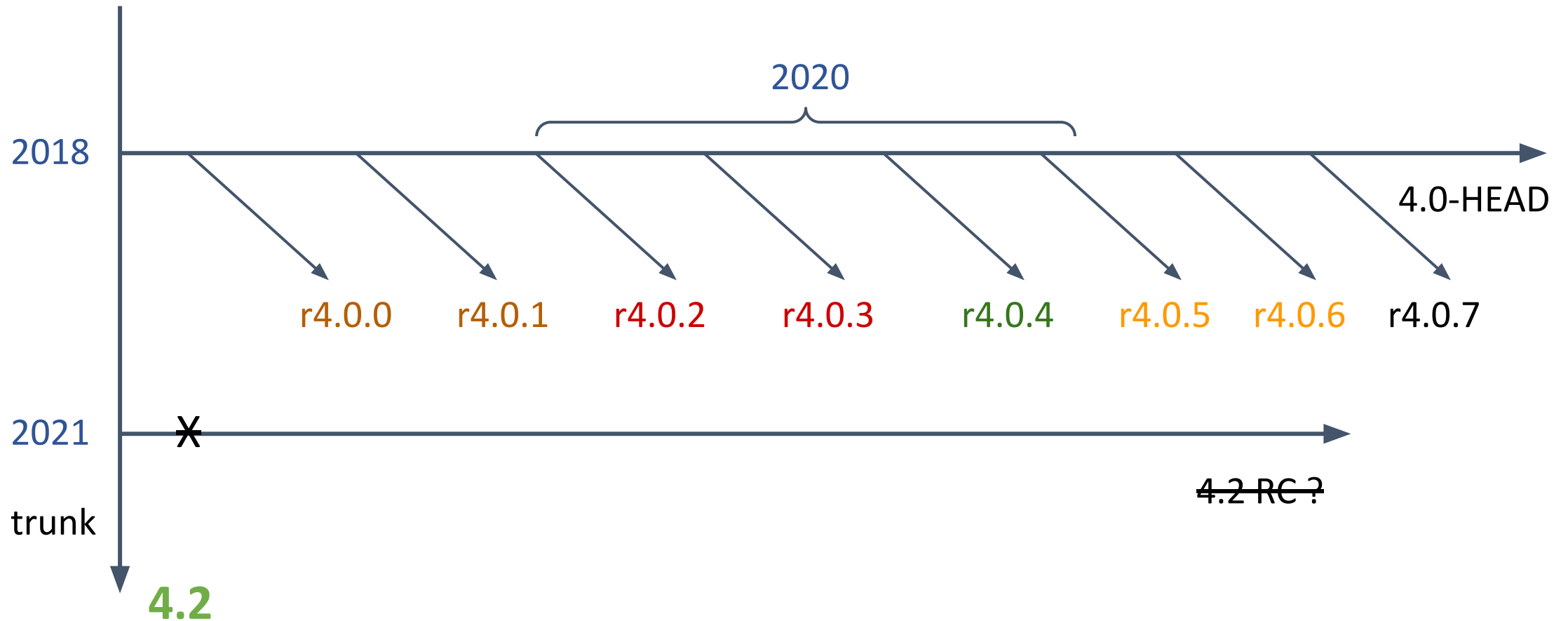
IMMERSE project

- H2020 call LC-SPACE-03-EO-2018. Dec 2018 - Dec 2022.
- **Accelerate** the **development of NEMO** ocean model and prepare a seamless transition from **research to operation** in CMEMS, CMEMS MFCs and **downstream** systems.
- **Objectives:**
 - **Improved performance** adapted to exploit future **HPC** technologies.
 - Describe ocean dynamics and biogeochemistry at **kilometric scale** with improved accuracy.
 - Exploitation of the next generation of **high resolution observing networks**.
 - **Interface CMEMS** observation and **model-based** products and detailed, **downstream** modelling systems.
 - Model code and tools with assessments suitable for **rapid deployment** in CMEMS.

NEMO 4.2

- **Kernel:** new higher order **HPG** scheme, **quasi-eulerian** coordinates
- **AGRIF:** **vertical** coordinates, **zooms** crossing periodic boundaries, **pre-processing tool** for **nested** model meshes
- **Air-sea:** **current feedback**, new **ABL 1D** model, **improvements** in **wave** coupling and forcing, and **bulk** formulae
- **Vertical physics:** **improvements** to **OSMOSIS**, **mass-flux convection** scheme
- **Sea-ice:** **EAP rheology**, energy & conservation **diags.**, improved **icebergs**
- **BGC:** **iron cycle** in ice sheets, **new interface** w. dynamics
- **HPC:** extended **MPI haloes**, **tiling**, **MPI3**, **loop fusion**, GPU diagnostics
- **IO:** refactored **OBS code**, restart read/write using XIOS

NEMO4



Now and future

- **2021: Validation** of the trunk → **4.2 release** by end of 2021
- **WIP: RK3 scheme**, ALE coordinates, **AGRIF**, **mixed-precision**, OMP
- **NEMO Development Strategy** to be written in 2022

- **NEMO priorities** (by M. Bell MO):
 - Meet research & operational needs
 - Modelling community + scientific / technical knowledge
 - Trail-blaze in a few areas & keep up-to-date important progress



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EXCELENCIA
SEVERO
OCHOA

Thank you

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